BENNETT
UNIVERSITY
THE TIMES GROUP

Program Structure & Syllabus

Bachelor of Technology (Computer Science Engineering)

Duration: 04 Years

Batch: 2024-2028

School of Computer Science Engineering and Technology

Vision of the University:

To be a global leader in education, research, and innovation, empowering higher learning ecosystem

Mission of the University:

- Empower all the members of the Bennett ecosystem and provide thought leadership, focus on nation building and prepare our graduates to move with the Times.
- Cultivate international partnerships and collaborations with academic institutions, industry, and government organizations and provide a rigorous and innovative education that equips students with the knowledge, skills, and ethical values required to excel in their careers.
- Foster a culture of lifelong learning, adaptability, and critical thinking, ensuring graduates are prepared to tackle challenges in all academic fields.
- Drive interdisciplinary research and innovation, pushing the boundaries of human knowledge, addressing pressing global issues and solving real world problems.
- Enhance a collaborative environment that encourages faculty and students to engage in research, innovation, and entrepreneurship, creating a lasting impact on society.
- Promote diversity, equity, and inclusion, ensuring that all individuals, regardless of background, feel welcomed, respected, and empowered.
- Prepare students to become global citizens, capable of addressing global challenges and contributing to the well-being of communities worldwide.
- Provide a globally connected career services networking with graduate employers and alumni.
- Foster a strong sense of ethical responsibility in our graduates, emphasizing the importance of ethical conduct, sustainability, and social impact in professional practice.
- Commit to ongoing assessment and improvement of our programs and invest in modern infrastructure and advanced technology to support teaching, research, and innovation adapting to the evolving needs of students, industries, and society.

Vision of the Department:

International Excellence and National Relevance in teaching, research, and technology development.

Mission of the Department:

1. Strive to continuously adapt and improve teaching-learning pedagogy and encourage the use of technology and online learning.
2. Innovate through Entrepreneurial framework, Research Projects, Quality publications and Consultancy.
3. Transparency, Teamwork and Timely execution will be three mantras of the department.

Program Educational Objectives (PEO):

PEO1: Provide graduates with a solid foundation in engineering principles to solve complex computer science problems effectively.

PEO2: Equip graduates with skills in software development, project management, and communication to design and implement innovative solutions using emerging technologies.

PEO3: Foster a mindset of continuous learning, enabling graduates to adapt to technological advancements and contribute to the field through research and development activities.

PEO to Mission Statement Mapping:

Mission Statements → PEO Statements ↓	M1	M2	M3
PEO1	1	2	1
PEO2	2	3	3
PEO3	3	1	2

1: Low **2: Medium** **3: High**

Program Outcomes (POs) and Program Specific Outcomes (PSOs):

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PSO1: Analyse a complex problem and propose its solution using various computer system concepts.

PSO2: Apply software development and project management methodologies on various platforms using emerging technologies to design, develop and implement solutions of problems.

PSO3: Foster the field of computing by taking a deep dive into its latest trends and going through new research & development activities.

Mapping of POs/PSOs to PEOs:

PEO Statements → Program Outcomes ↓	PEO1	PEO2	PEO3
PO1	3	2	
PO2	3	1	
PO3	2	3	
PO4	3		1
PO5	1	3	2
PO6		2	
PO7	2	2	
PO8		2	
PO9		3	2
PO10		2	1
PO11		2	
PO12		2	3
PSO1	3	2	1
PSO2	2	3	1
PSO3	1	2	3

1: Low **2: Medium** **3: High**

Course Curriculum

Semester: I

Curriculum for Batch 01 to Batch 56

S.No.	Code	Title	Lecture Hrs/Week	Tutorial Hrs/Week	Practical Hrs/Week	Credit
1	CSET101	Computational Thinking and Programming	2	1	4	5
2	EMAT101L	Engineering Calculus	3	1	0	4
3	CSET103	New Age Life Skills	2	0	0	2
4	CSET102	Introduction to Electrical and Electronics Engineering	2	1	2	4
5	CSET110	Foundations of Innovation and Entrepreneurship	1	0	0	0

Curriculum for Batch 57 to Batch 100

S.No.	Code	Title	Lecture Hrs/Week	Tutorial Hrs/Week	Practical Hrs/Week	Credit
1	CSET101	Computational Thinking and Programming	2	1	4	5
2	EMAT101L	Engineering Calculus	3	1	0	4
3	CSET108	Environment and Sustainability	3	0	0	3
4	EPHY111L	Electromagnetism and Mechanics	3	1	2	5
5	CSET110	Foundations of Innovation and Entrepreneurship	1	0	0	0

***CSET102, CSET103, EPHY111 L & CSET108 will be run in both Sem-I and Sem-II. Half of CSE students will get (EPHY111L + CSET108) and other half (CSET103+CSET102) in Semester - I and vice versa in Semester - II. CSET110 will be run as a mandatory Pass/Fail course.**

Semester I

Name of Program	**Bachelor of Technology (Computer Science Engineering)**				
CSET101	**Computational Thinking and Programming**	**L**	**T**	**P**	**C**
Owning School/Department	**School of Computer Science Engineering and Technology**	**2**	**1**	**4**	**5**
Pre-requisites/Exposure	**-**				

Course Outcomes (COs)

On completion of this course, the students will be able to:

CO1: Solve given problem in Python by using standard programming constructs.
CO2: Build programs using the features of object-oriented programming languages.
CO3: Make use of Python inbuilt APIs to write functions.

CO-PO/PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2			3				2			2	3		
CO2	2		2	3		2				3			2	1	2
CO3	3	3	3	2	3				2						2

1=weakly related 2= moderately related 3=strongly related

Course Contents:

Module I: **08 lecture hours**

Why Python, Applications of Python, Versions of Python, Number system, Binary, Octal, Literals, Variables, Data types, Operators, Control Structures if/else/elif, Nested if/else, Lists/Nested Lists, Tuple.

Module II: **10 lecture hours**

Iterative Control, while loop, For loop, Range, Break, Continue, Pass, Nested Loops, Loop inside if, List Operations, List comprehension, Membership operator, Functions, Default argument, required arguments, keyword argument, variable arguments, Function invoking, Nested functions, Lambda functions, Map Reduce, Recursive Functions, Factorial, GCD using Euclid Algorithm, Dictionary Operations, Sets, Enumerators.

Module III: **10 lectures hours**

String Operations, Slicing, File Handling, Exception Handling, Modules, Namespaces, Local, Global, and Built-in Namespaces, Object Oriented Programming, Classes and Objects, Encapsulation, Data abstraction, Inheritance, Polymorphism, Interactive Graphics, Displaying Images, Generating Colors, Graphics Objects, Entry Objects, Turtle, Tkinter, Working with Widgets, Controlling Layout with Geometry Managers, Events and Event Handlers, Developing Interactive applications.

Studio Work/Laboratory Experiments:

The lab component of this course is designed to introduce online-coding tools such as Microsoft Azure, Colab to the students and provide hands-on experience with the concepts taught in the lectures.

Text Books :

1. Dierbach, Charles. *Introduction to computer science using python: A computational problem-solving focus*. Wiley Publishing, 2012. ISBN 9789332584686.

Reference Books :

1. Martinez, D. and Jesús, S. D, *Applied Computational Thinking with Python: Design Algorithmic Solutions for Complex and Challenging Real-world Problems*. Packt Publishing, 2021. ISBN 89351507314.

Name of Program	**Bachelor of Technology (Computer Science Engineering)**				
EMAT101L	**Engineering Calculus**	**L**	**T**	**P**	**C**
Owning School/Department	**School of Computer Science Engineering and Technology**	**3**	**1**	**0**	**4**
Pre-requisites/Exposure	**-**				

Course Outcomes (COs)

On completion of this course, the students will be able to:

CO1: Convergence and divergence of sequence and series.

CO2: Continuity, differentiability and integrability for functions of one variable and multi variables. Approximating the smooth function with a polynomial.

CO3: Computing the area and volume of functions up to three variables.

CO4: Solving the problems using computational software packages.

CO-PO/PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2			3				2			2	3		
CO2	2	3		3						3			2		
CO3	3	3	3	2	3				2						2

1=weakly related 2= moderately related 3=strongly related

Course Contents:

Module I: 12 lecture hours

The Real Number System, Archimedean Property, Convergence of a Sequence, Monotone Sequences, Cauchy Criterion, Bolzano-Weierstrass Theorem, Limit inferior and Limit Superior. Infinite Series, Convergence Tests and Alternating series. Limit, Continuity, Existence of Maxima,Intermediate Value Property.

Module II: 12 lecture hours

Differentiability, Rolle's Theorem, Mean Value Theorem. Convexity, Concavity, L'Hospital Rule,Fixed Point Iteration Method, Taylor's Theorem, Taylor Series, Power Series. Riemann Integration, Fundamental Theorems of Calculus, Riemann Sum. Improper Integrals, Beta-Gamma Functions, Differentiation under integration.

Module III: 08 lectures hours

Area between two curves; Polar Coordinates, Volumes by slicing, Washer and Shell Methods, Length of a plane curve, Areas of Surfaces of Revolution. Review of vectors, Calculus of Vector Valued Functions,

Functions of Several Variables: limit, Continuity and Differentiability, Chain Rule, Directional Derivative, Gradient.

Module IV: **10 lectures hours**

Mixed Derivative Theorem, MVT, Extended MVT, Taylor’s Theorem in Multiple Variables, Hessian, Maxima, Minima, Second Derivative Test, Lagrange Multiplier Method. Double Integrals, Change of Variable in a Double and Triple Integrals, Area of a Parametric Surface and surface integral. Surface Area, Surface Integrals, Line Integrals Green’s Theorem and Applications.

Text Books :

1. Weir, Maurice D., Joel Hass, and Frank R. Giordano. *Thomas' calculus*. 14th ed. Pearson Education India, 2018. ISBN 9789353060411.
2. Ross, Kenneth A. *Elementary Analysis the Theory of calculus*. 2nd ed. Springer publication, 2013. ISBN 978-1461462705.

Reference Books :

1. Stewart, James. *Calculus*. 7th ed. Cengage Learning, 2012. ISBN 0538497815.
2. Ghorpade, Sudhir R., and Balmohan Vishnu Limaye. *A course in calculus and real analysis*. 1st ed. New York: Springer, 2006. ISBN 978-0387305300.
3. Bartle, Robert G., and Donald R. Sherbert. *Introduction to real analysis*. 4th ed. New York: Wiley, 2014. ISBN 812655181X.
4. Kreyszig, Herbert, and Erwin Kreyszig. *Advanced Engineering Mathematics, Student Solutions Manual and Study Guide.* 10th ed. John Wiley & Sons, 2010. ISBN 978-8126554232.

Name of Program	**Bachelor of Technology (Computer Science Engineering)**				
CSET108	**Environment and Sustainability**	**L**	**T**	**P**	**C**
Owning School/Department	**School of Computer Science Engineering and Technology**	**3**	**0**	**0**	**3**
Pre-requisites/Exposure	**-**				

Course Outcomes (COs)

On completion of this course, the students will be able to:

CO1 : Demonstrate analytical thinking skills concerning environmental topics.
CO2 : Demonstrate an ability to combine the many disciplines and fields that intersect with environmental concerns.
CO3 : Illustrate an integrative approach to environmental issues with a focus on sustainability.

CO-PO/PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2			3				2			2	3		2
CO2	2	2		2						3			2	2	1
CO3	3	3	3	2	3				2					2	2

1=weakly related 2= moderately related 3=strongly related

Course Contents:

Module I: **06 lecture hours**

Environmental Sustainability, Ecosystems, and Climate Change: Overview of Environmental Sustainability, Sustainability and Population Growth, Exploration of Growth Curves, Way forward – Ecosystems and climate change introduction – Ecosystem dynamics –Tragedy of commons - Tragedy of commons solutions – Ecosystems and extinctions – Weather vs. Climate – Climate changes in the past – Climate change in the present – Climate processes.

Module II: **05 lecture hours**

Biodiversity and its conservation: Biodiversity – Value of biodiversity – Threats to biodiversity - Conservation of biodiversity – Case studies.

Module III: **08 lectures hours**

Natural resources: Natural Resources and Their Challenges, Renewable and Non-renewable Energy Sources, Water's Role in Agriculture, Agriculture's Connection to Food Production, Addressing Issues and Solutions in Agriculture and Food Production.

Module IV: **08 lectures hours**

Environmental pollution: Causes, effects and control measures of various types of pollutions - Air pollution - Water pollution - Wastewater treatment - Soil pollution - Noise pollution - Thermal pollution - - Solid waste management - E-waste - Case studies on pollution.

Module V: **07 lectures hours**

Ethical Perspectives on the Environment, Global Environmental Policies, Environmental Legislation in India, Environmental Impact Assessment, Challenges Encountered in Enforcing Environmental Laws.

Module VI: **08 lectures hours**

Life cycle analysis and sustainability thinking: Introduction of LCA – Methodology of LCA – ISO 14044 Significance of LCA – Case studies of LCA .

Text Books :

1. Bharucha, Erach. *Textbook of environmental studies for undergraduate courses*. 2nd ed. Universities Press, 2013. ISBN 978-8173718625.

Reference Books :

1. Lodish, Harvey, Arnold Berk, S. Lawrence Zipursky, Paul Matsudaira, David Baltimore, and James Darnell. *Molecular Cell Biology*. 8th ed. WH Freeman, 2016. ISBN 978-1319067748.

Name of Program	**Bachelor of Technology (Computer Science Engineering)**				
CSET110	**Foundations ofInnovation and Entrepreneurship**	**L**	**T**	**P**	**C**
Owning School/Department	**School of Computer Science Engineering and Technology**	**1**	**0**	**0**	**0**
Pre-requisites/Exposure	**-**				

Course Outcomes (COs)

On completion of this course, the students will be able to:

CO1: To discuss the basic understanding of the relevant concepts and practices of entrepreneurship.
CO2: To recognize the essential criteria in the decision to become an entrepreneur or opt for entrepreneurship.
CO3: To practice with the basic tools and tactics required to manage and grow an entrepreneurial firm.

CO-PO/PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2			3				2			2	3		
CO2	2	2		3					1	3			2		3
CO3	3	3	3	2	3				2						2

1=weakly related 2= moderately related 3=strongly related

Course Contents:

Module I: **10 lecture hours**

DISCOVERING THE ENTREPRENEUR & ENTREPRENEURSHIP: The psychology of an entrepreneur, what is an entrepreneur? The entrepreneurial mindset: looking inside the black box, entrepreneurial expertise – orientation, do: Interact with a start-up founder, do: discover a problemto solve.

Module II: **09 lecture hours**

OVERVIEW OF ENTREPRENEURSHIP: Evolving concept of entrepreneurship & entrepreneurial environment, entrepreneurial opportunity –the customer, market, and competition, how to avoid the pitfalls of entrepreneurship – The dark side, myths & realities about entrepreneurship, do: know your customer, do: perform market study –competition analysis.

Module III: **09 lectures hours**

WHERE DO GOOD IDEAS COME FROM? Creativity in entrepreneurship, the creative process–stages/steps, creative thinking – techniques, sources for generation of Ideas, and role of Imagination, effectuation, Improvisation, analogous thinking, etc, problem finding & solving – divergent /convergent, associative approaches and do: generate viable Ideas, do: prototype asolution.

Name of Program	**Bachelor of Technology (Computer Science Engineering)**				
CSET103	**New Age Life Skills**	L	T	P	C
Owning School/Department	**School of Computer Science Engineering and Technology**	2	0	0	2
Pre-requisites/Exposure	**-**				

Course Outcomes (COs)

On completion of this course, the students will be able to:

CO1: By the end of this course, students should be able to express their role in improving their quality of life.
CO2: By the end of this course, students should be able to understand human psychology and its applications to improve human achievements and happiness to substantial extent.
CO3: By the end of this course, students should be able to reflect on the aspects of leadership, motivation, and stress management.
CO4 : By the end of this course, students should be able to appreciate the nature of positive and proactive thinking and assertiveness.
CO5: By the end of this course, students should be able to apply concepts, tools and frameworks of emotional intelligence and stress management

CO-PO/PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						**3**	**2**	**3**	**3**	**3**	**3**			**3**	**1**
CO2						**3**	**2**	**3**	**3**	**3**	**3**			**3**	**1**
CO3						**3**	**2**	**3**	**3**	**3**	**3**			**3**	**1**
CO4						**3**	**2**	**3**	**3**	**3**	**3**			**3**	**1**
CO5						**3**	**2**	**3**	**3**	**3**	**3**			**3**	**1**

1=weakly related 2= moderately related 3=strongly related

Course Contents:

Module I: **4 lecture hours**

Introduction to Life Skills, the critical role of management skills, Developing Self-awareness: Key dimensions, enigma of self-awareness, Understanding and Appreciating Individual differences, Self-esteem, Case studies and Practice Sessions.

Module II: **4 lecture hours**

Introduction to communicating and thinking, Communication, Thinking and reasoning, Proactive thinking, Positive thinking, Assertiveness, Emotional Intelligence, Values and Ethics, Case studies and Practice Sessions.

Module III: **4 lectures hours**

Setting goals, Goal Setting: Setting SMART Goals, what are the main components, Managing time and prioritizing, Time Management matrix, Balancing Time and Goal, case studies, Practice Sessions.

Module IV: **4 lectures hours**

Diagnostic Surveys for Creative Problem Solving, Problem Solving, Creativity and Innovation, Steps in Analytical Problem Solving, Multiple Approaches to creativity, Conceptual Blocks, Case studies and Practice Sessions.

Module V: **4 lectures hours**

Attitudes, what are the main components? Behavior and attitude, Major job attitude, Job satisfaction, Satisfied and dissatisfied employees on the workplace, Personality, The Myers-Briggs Type Indicator, The Big Five Personality Model, other personality traits relevant to Life skills, Case studies and Practice Sessions.

Module VI: **5 lectures hours**

Diagnostic Surveys for Building Effective Teams, Team Development Behaviour, Developing Credibility, Leading Teams, Exercises in Building Effective Teams, Team Development Behaviour, Developing Teams and Work, Leading Teams, Team Membership, Developing Credibility, Exercises in Building Effective Teams, Case studies and Practice Sessions.

Module VII: **4 lectures hours**

Making Oral and Written Presentations, Introduction to Technical Communication, Process of communication, Essential Elements of Effective Presentations, speaking as a Leader, presenting yourself professionally, developing your Interpersonal Skills, Argument Building, develop your facilitation skills, Making Formal Presentations, Creative Writing for social media, developing self-brand, Case studies and Practice Sessions.

Module VIII: **4 lectures hours**

Diagnostic Survey for Gaining Power and Influence, Building a Strong Power Base and Using Influence wisely, Strategies for gaining organizational power, Transforming power into influence, activities for gaining power and influence, Diagnostic Survey for Motivating Others, Increasing Motivation and Performance, Diagnosing Work Performance Problems, Enhancing Individual abilities, Fostering a Motivating Work Environment, Elements of an Effective Motivation Program, Activities for Motivating Others, Case Studies and Practice Sessions.

Module IX: **4 lectures hours**

Diagnostic Survey for Managing Conflict, Interpersonal Conflict Management, Diagnosing the Type of Interpersonal Conflict, Selecting the Appropriate Conflict Management Approach, Resolving Interpersonal Confrontations Using the Collaborative Approach, Conflict Management Strategies, activities for Improving Managing Conflict Skills, Case Studies and Practice Sessions.

Module X: **5 lectures hours**

Diagnostic Survey for Empowering and Delegating, Management Dilemma Involving Empowerment, The Meaning of Empowerment, Dimensions of Empowerment, Self-Efficacy, Self-Determination, Personal Consequence, How to Develop Empowerment, providing Support, providing Information, Providing Resources, Inhibitors to Empowerment, Delegating Work, Advantages of Empowered Delegation, Review of Delegation Principles, Case Studies and Practice Sessions.

Studio Work/Laboratory Experiments:

1. Group Presentations
2. Group Activities
3. Role Plays
4. Group Decision Making activity
5. Group Treasure Hunt
6. Creating Team profiles
7. Creating Self Profiles

Text Books :

1. *Whetten David A. and Kim S. Cameron, Developing Management Skills (8th ed.), Pearson, 2017. ISBN 9789332584686, ISBN 9332584680.*

2. *Wadkar Alka, Life Skills for Success (1st ed.), Sage Publications, 2016. ISBN 9789351507314, ISBN 9351507319.*

Name of Program	**Bachelor of Technology (Computer Science Engineering)**				
CSET102	**Introduction of Electrical and Electronics Engineering**	**L**	**T**	**P**	**C**
Owning School/Department	**School of Computer Science Engineering and Technology**	**2**	**1**	**2**	**4**
Pre-requisites/Exposure	**-**				

Course Outcomes (COs)

On completion of this course, the students will be able to:

CO1 : To articulate the fundamental parameters governing an electrical circuit such as current, voltage.
CO2 : To explain basic electronic components such as resistors, capacitors, and inductors.
CO3 : To make use of concepts, working, and application of various circuits using the components on a breadboard.

CO-PO/PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1				2							3		
CO2	2	1				1								2	
CO3		1		1		1						1			2

1=weakly related 2= moderately related 3=strongly related

Course Contents:

Module I: 07 lecture hours

Basic Circuit Theory: Charge, current, voltage, electric field, conductance, resistance, Ohm's law; current source, voltage source, dc, ac, periodic signal concept, examples of different periodic signals, their average, RMS value, resistors in series and parallel, voltage and current division. Kirchoff’s current law (KCL) and Kirchhoff’s voltage law (KVL), Nodal analysis and Mesh analysis.

Module II: 07 lecture hours

Network theorems: Maximum power transfer theorem, Source Transformation, Superposition theorem, Thevenin’s theorem, Norton’s theorem. Introduction to capacitor (C), introduction to phasor diagram, series and parallel combination of capacitors, Impedance and frequency dependency, Introduction to inductor (L), introduction to phasor diagram, series and parallel combination of inductors, Impedance and frequency dependency, units of L, C measurements, lowpass, highpass and bandpass filter, transfer function, Single phase motors, dc motors, stepper motors, their applications.

Module III: 08 lectures hours

Diodes and its applications, Semiconductor Materials: Electrons and Holes, Intrinsic and Extrinsic Semiconductors, doping of n and p-type semiconductors, Diode circuits: PN Junction diode and its applications: Half wave, center tapped full wave rectifier circuit, bridge rectifier circuit, the efficiency of rectifier circuits, ripple factor, rectifiers with filter circuits.

Module IV: **06 lectures hours**

Op-Amp: Characteristics of an Op-amp. Inverting and Non-inverting amplifier, Integrator, Differentiator.

Text Books :

1. Charles, K. Alexander, and N. O. Matthew. *Fundamentals of electric circuits*. 1st ed. McGraw-hill Education, 2017. ISBN 9789353165505.
2. Boylestad, Robert L., and Louis Nashelsky. *Electronic devices and circuit theory*. 1st ed. Pearson Education India, 2009. ISBN 9788131703144.
3. Tsividis, Yannis. *A First Lab in Circuits and Electronics*. 1st ed. Wiley, 2002. ISBN 9780471386957.

Reference Books :

1. Neamen, Donald A. *Microelectronics: circuit analysis and design*. 1st ed. New York: McGraw-Hill, 2009. ISBN 978-0073380643.
2. Bell, David A. *Electronic instrumentation and measurements.* 3rd ed. Oxford University Press India, 2013. ISBN 978-0195696141.

COURSE BRIEF

COURSE TITLE	**Electromagnetism and Mechanics**	**PRE-REQUISITES**	None
COURSE CODE	EPHY111L	**TOTAL CREDITS**	5
COURSE TYPE	Core	**L-T-P FORMAT**	3-1-2

COURSE SUMMARY

Mechanics: Vector operators and coordinate systems, Kinematics, Frames of reference – Cartesian and polar, Newton's laws of motion and its application, Momentum, Work and Energy, Kinetic and Potential energy, Conservative and non-conservative forces, Angular momentum, Dynamics of rigid body rotation, Gravitation and planetary motion, Kepler's laws, Harmonic oscillator.

Electromagnetism: Gauss' law and its applications, Electrostatic potential, Electric fields in matter, Electric polarization, Bound charges, Electric Permittivity and dielectric constant. Biot-Savart law, Ampere's law and applications, Magnetic fields in matter, Magnetization, Bound currents, Faraday's law of electromagnetic induction. Displacement current and the generalized Ampere's law, Maxwell's equations, Electromagnetic waves

COURSE-SPECIFIC LEARNING OUTCOMES (CO)

By the end of this program, students should have the following knowledge, skills and values:

CO1: Ability to solve problems involving particles using Newton's laws of motion

CO2: Capacity to understand and determine linear and angular trajectories of a particle.

CO3: Apply conservation laws in mechanical and electromagnetic systems.

CO4: Capability to calculate electrostatic fields and potentials, produced by regular shaped charged bodies.

CO5: To understand magnetic fields produced by variously shaped current carrying bodies.

CO6: To appreciate the interconnectedness of electric and magnetic phenomena and to realize the significance of Maxwell's equations.

Detailed Syllabus

Module 1 (Contact hours: 21)

- Vector operators and coordinate systems; Newton's laws of motion and its application; Momentum, Work and Energy: Kinetic and Potential energy; Conservative and non-conservative forces.
- Angular momentum; Gravitation and planetary motion, Kepler's laws; Harmonic oscillator.

Module 2 (Contact hours: 21)

- Gauss' law and its applications, Electrostatic potential; Electric fields in matter, Electric polarization, Bound charges, Electric Permittivity and dielectric constant.

- Biot-Savart law, Ampere's law and applications, Magnetization, Bound currents; Faraday's law of electromagnetic induction; Introduction to Maxwell's equations.

STUDIO WORK / LABORATORY EXPERIMENTS:

Refer Lab Manual for a detailed and updated description.

1. Error measurements
2. Moment of Inertia of a Fly wheel
3. Viscosity of a liquid
4. Young's modulus of a beam
5. Determination of coefficient of static friction of a rough surface
6. Determine Planck's constant by photoelectric effect
7. Measurement of band gap
8. Determination of e/m ratio
9. Study of uniform motion and two-body collisions
10. Modes of vibration of coupled pendulum

TEXTBOOKS/LEARNING RESOURCES:

1. *Introduction to Electrodynamics*, David. J. Griffiths, 4th Edition, Prentice-Hall International, Eastern Economy Edition, 2012.

2. *An Introduction to Mechanics*, D. Kleppner & R. J. Kolenkow, Cambridge University Press, Second Edition.

REFERENCE BOOKS/LEARNING RESOURCES:

1. *Fundamentals of Physics*, D. Halliday, R. Resnick, & J. Walker, John Wiley & Sons, 10th Edition
2. *Physics*, *Vol. 1 & 2*, Resnick, Halliday and Krane, 5th edition, Wiley Student Edition.

EVALUATION POLICY

Midterm	20
End term	40
Laboratory Performance	30
Quiz	10